Fermi National Accelerator Laboratory

FERMILAB-TM-1705

The Winds of Fermilab

R. Tomlin
Fermi National Accelerator Laboratory
P.O. Box 500
Batavia, Illinois 60510

December 6, 1990

Revised Edition

Operated by Universities Research Association Inc. under contract with the United States Department of Energy

The Winds of Fermilab

R. Tomlin
December 6, 1990

The drought of 1988 caused the operations group to become concerned about the rate of evaporation from the Main Ring cooling ponds. We needed a way to data-log windspeed and direction. We had an old broken Heathkit weather station. The anemometer and windvane were salvaged and repaired. An interface to two MADC channels on the PBAR CAMAC link was built on an old piece of CAMAC card with salvaged parts. The project cost nothing. It has been in service since Janruary 1989.

Circuit

The anemometer drives a clear plastic disk with radial dark bands which interrupt a light beam. Pulses go to a National tachometer chip, then to an MADC input.

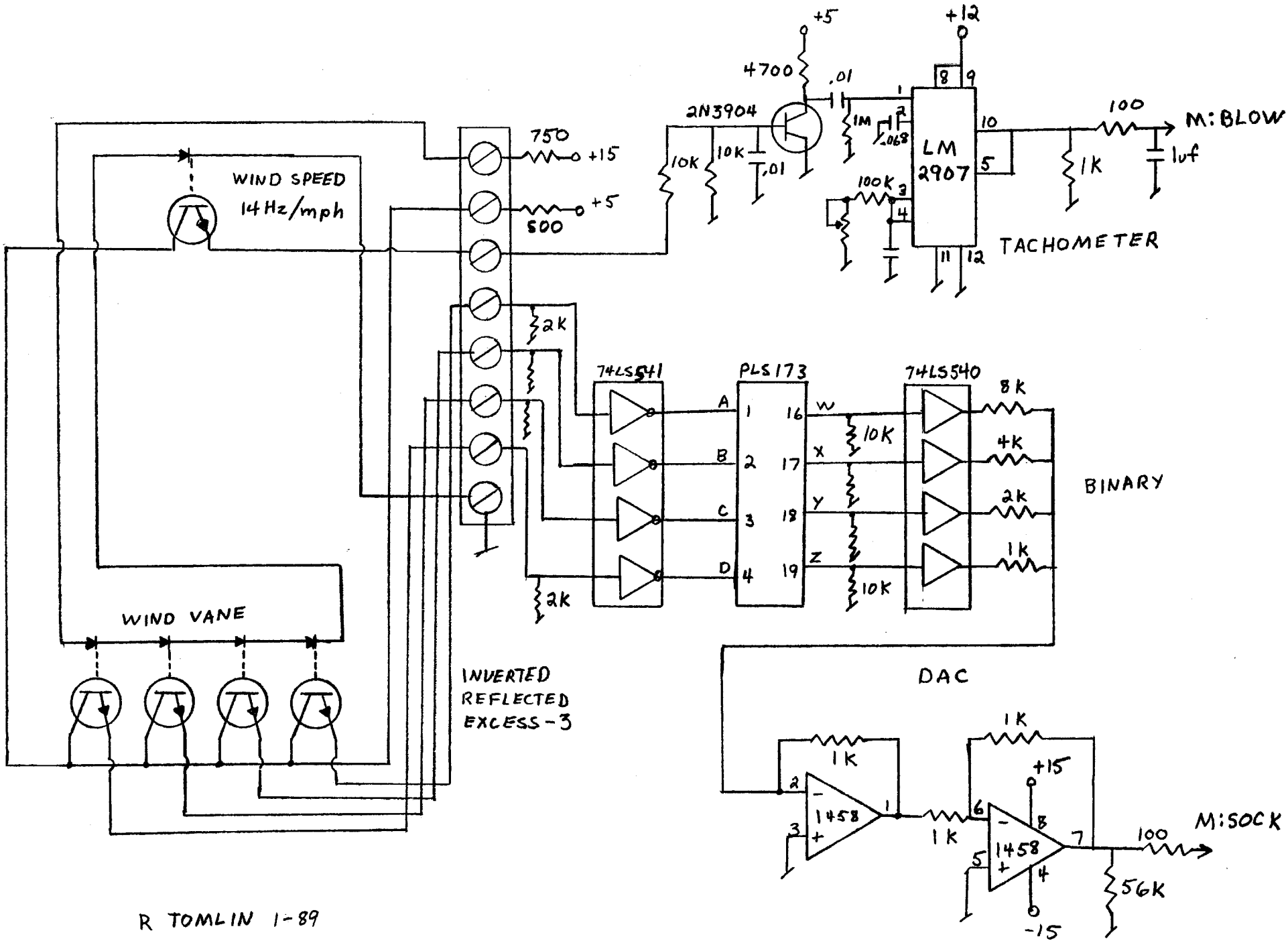
The windvane senses 16 directions with a code wheel. A PAL is used to convert the inverted reflected excess-3 grey code to binary. Four bits of binary go to a homebrew DAC and then to an MADC input.

PAL equations and a circuit diagram are included here.

Utility

The mechanical cups are accurate to within 10 % up to 18 mph. Recently the mechanics have shown signs of wear. Things were recalibrated with an Omega windspeed meter. The windvane shows no sign of wear. Resolution is 22.5 degrees.

Display is via parameter page and plots, a graphical utility on node DEVL for DEC terminals written by Denten Morris, and a Fermi console secondary application written by Adam and Walter Kissel. This graphical representation uses software damping to compensate for fast changes in wind direction caused by the data acquisition system.


+5
+12
4700
.01
2N3904
1M
.068
LM
2907
100
M:BLOW
1uf
1K
10K
10K
.01
100K
750
+15
+5
500
WIND SPEED
14 Hz/mph
2K
74LS541
PLS173
74LS540
8K
4K
2K
1K
10K
BINARY
WIND VANE
INVERTED
REFLECTED
EXCESS-3
DAC
1458
M:SOCK
56K
-15
R TOMLIN 1-89

PLS173

WINDIR PLA FOR THE F23 WIND DIRECTION. CONVERT EXCESS-3 GRAY TO BINARY
RAY TOMLIN DEC 20, 1988

A	B	C	D	05	06	07	08	09	10	11	GND
13	14	15	W	X	Y	Z	20	21	22	23	VCC

W = /D*C*B*/A + /D*C*/B*A + D*C*/B*/A + D*C*B*A
+ D*/C*B*/A + D*/C*/B*A + /D*/C*/B*/A + /D*/C*B*A

X = /D*C*B*A + /D*C*/B*A + D*C*/B*A + D*C*B*A
+ D*/C*B*A + D*/C*/B*A + /D*/C*/B*A + /D*/C*B*A

Y = /D*C*/B*/A + D*C*/B*/A + D*C*/B*A + D*C*B*A
+ D*/C*/B*/A + /D*/C*/B*/A + /D*/C*/B*A + /D*/C*B*A

Z = D*C*B*/A + D*/C*B*/A + D*/C*B*A + D*/C*/B*A
+ D*/C*/B*/A + /D*/C*/B*/A + /D*/C*/B*A + /D*/C*B*A

DESCRIPTION

A,B,C,D ARE $\overline{\text{not}}$ REFLECTED EXCESS-3 GREY CODE INPUT
W,X,Y,Z ARE STRAIGHT BINARY OUTPUT
Copy W,X,Y,Z to /W,/X,/Y,/Z to get REFLECTED EXCESS-3 GREY INPUT